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Model 331 Temperature Controller

Temperature Range		
Diodes	**Model**	**Useful Range**
Silicon Diode	DT-670	1.4 - 500 K
GaAlAs Diode	TG-120	1.4 - 475 K
Positive Temperature Coefficient RTDs		
100 W Platinum	PT-100	30 - 800 K
Rhodium-Iron	RF-800-4	1.4 - 400 K
Negative Temperature Coefficient RTDs		
Germanium	GR-200A-1000	2 - 100 K
Germanium	GR-200A-250	1.2 - 40 K
Carbon Glass™	CGR-1-500	3 - 325 K
Cernox™	CX-1050 AA or SD	3.5 - 325 K
Cernox™	CX-1030 AA or SD	2 - 325 K
High Temperature Cernox™	CX-1030 AA or SD	2 - 420 K
Rox™	RX-102A	2 - 40 K
Rox™	RX-202A	3 - 40 K
Thermox™	TX-104-GB	110 - 325 K
Thermocouples		
Type K	9006-006	3.2 - 1500 K
Type E	9006-004	3.2 - 930 K
Type T	9006-008	3.2 - 670 K
Chromel-AuFe 0.07%	9006-002	1.4 - 610 K
Single excitation current may limit the low temperature range of NTC resistors.		
***Sensors sold separately**		

Thermometry	
Number of Inputs	2
Input Configuration	Each input is factory configured for either diode/ RTD or thermocouples

	Diode / RTD	Thermocouple
Measurement Type	Four-lead differential with current reversal	Two-lead, room temperature compensated
Excitation	Constant Current	NA
Supported Sensors	Diodes: Silicon, GaAlAs RTDs: 100 Ω Platinum, 100 Ω Platinum, Germanium, Carbon-Glass, Cernox™, Rox™, Thermox	Most thermocouple type
Standard Curves	DT-470, DT-500D, DT-670, PT-100, PT-1000, RX-102A, RX-202A	Type E, Type K, Type T,AuFe 0.07% Vs CH, AuFe 0.03% Vs CH
Input Connector	6-pin DIN	Ceramic isothermal block
Isolation	Sensor inputs optically isolated from other circuits but not each other	
A/D Resolution	24 bit	
Input Accuracy	Sensor dependent; see Sensor Input Performance chart	
Measurement Resolution	See Sensor Input Performance chart	
Maximum Update Rate	10 readings/s on each input (except 5 readings/s on input A when configured as thermocouple)	
User Curves	Room for 20 200-point CalCurves or user curves	
SoftCal	Improves accuracy of DT-470 diode to ±0.25 K from 30 K to 375 K. Improves accuracy of Platinum RTDs to ±0.25 K from 70 K to 325 K. Stored as user curves	
Math	Maximum, Minimum, and Linear Equation (Mx + B) or M(x+B)	
Filter	Averages 2 to 64 input readings	

Control	
Control Loops	2 on 331S, 1 on 331E
Control Type	Closed loop digital PID with Manual Heater or open loop
Tuning	AutoTune (one loop at a time), PID, PID zones
Control Stability	Sensor dependent; see Sensor Input Performance chart
PID Control Parameters	
Proportional (Gain)	0 – 1000 with 0.1 setting resolution
Integral (Reset)	1 – 1000 (1000/s) with 0.1 setting resolution
Derivative (Rate)	1 – 200% with 1% resolution
Manual Heater	0 – 100% with 0.01% setting resolution
Zone Control	10 temperature zones with P, I, D, Manual Heater, and Heater Range
Setpoint Ramping	0.1 to 100 K/min
Protection	Curve temperature limits, power up heater off, short circuit protection

	Loop 1	Loop 2
Heater Output Type	Variable DC current source	Variable DC voltage source
Heater Output D/A Resolution	18 bit	16 bit
Max Heater Power	50 W	1 W
Max Heater Output Current	1 A	0.1 A
Heater Output Compliance	50 V	10 V
Heater Output Ranges	3 decade steps in power	1
Heater Load Type	Resistive	Resistive
Heater Load Range	10 Ω to 100 Ω recommended	100 Ω minimum
Heater Load for Max Power	50 W	100 W
Heater Noise (<1 kHZ) RMS	50 µV + 0.01% of output voltage	< 0.3 mV
Isolation	Optical isolation between output and other circuits	None
Heater Connector	Dual banana	Detachable terminal block

Loop 1 Full Scale Heater Power at Typical Resistance

Heater Resistance	Heater Range	Heater Power
10 Ω	Low Med High	100mW 1 W 10 W
25 Ω	Low Med High	250mW 2.5 W 25 W
50 Ω	Low Med High	500mW 5 W 50 W

Front Panel	
Display	2 line by 20 character, 9 mm character height, vacuum fluorescent display
Number of reading displays	1 to 4
Display Units	K, °C, V, mV, Ω
Reading Source	Temperature, sensor units, max, min, and linear equation
Display Update Rate	All readings twice per second
Temperature Display Resolution	0.001° between 0° - 99.999°, 0.01° between 100° - 999.99°, 0.1° above 1000°
Sensor Units Display Resolution	Sensor dependent, to 5 digits
Other Displays	Setpoint, Heater Range, and Heater Output (user selected)
Setpoint Setting Resolution	Same as display resolution (actual resolution is sensor dependent)
Heater Output Display	Numeric display in percent of full scale for power or current
Heater Output Resolution	1%
Display Annunciators	Control Input, Remote, Alarm, Tuning, Ramp, Max, Min, Linear
Keypad	20 full travel keys, numeric and specific functions
Front Panel Features	Front panel curve entry, display brightness control, keypad lock-out
Interface	
IEEE-488 Interface (331S)	
Features	SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT0, C0, E1
Reading Rate	To 10 readings/s on each input
Software Support	LabView driver (consult factory for availability)
Serial Interface	
Electrical Format	RS-232C
Max Baud Rate	9600 BAUD
Connector	DE-9
Reading Rate	To 10 readings/s on each input (at 9600 baud)
Special Interface Features	Model 330 command emulation mode
Alarms	
Number	4, high and low for each input
Data Source	Temperature, Sensor Units, Linear Equation

Settings	High Setpoint, Low Setpoint, Deadband, Latching or Non-Latching, Audible On/Off
Off Actuators	Display annunciator, beeper, relays
Relays (331S)	
Number	2
Contacts	Normally Open (NO), Normally Closed (NC), and Common (C)
Contact Rating	30 VDC at 5 A
Operation	Activate relays on high, low, or both alarms for either input or manual
Connector	Detachable terminal block
Analog Voltage Output (331S)	
Scale	User selected
Update Rate	10 readings per second
Data Source	Temperature, Sensor Units, Linear Equation
Settings	Input, source, top of scale, bottom of scale, or manual
Range	±10 V
Resolution	0.3 mV
Accuracy	±2.5 mV
Minimum Load Resistance	100 W (short circuit protected)
General	
Ambient Temperature	15 - 35 °C at rated accuracy. 10 - 40 °C at reduced accuracy
Power Requirement	100, 120, 220, 240 VAC, +5% -10%, 50 or 60 Hz, 120 VA
Size	217 mm W x 90 mm H x 317 mm D (8.5" x 3.5" x 14.5"), half rack
Weight	4.77 kg (10.5 lbs)

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